CLAIMS

1.   A method for·determining the key of an audio signal, the method comprising the steps of:

-   ▪ for each of a plurality of signal portions, analysing (104) the portion to identify (108) a m usical note, a nd w here at l east o ne musical n ote i s identified:
    -   o determining (110) a strength associated with the or each musical note; and
    -   o generating (112) a d ata record c ontaining t he i dentity of t he o r each musical note, the strength associated with the or each musical note and the identity of the portion;
-   ▪ for each of the data records, ignoring (118) the strength associated with an identified musical note where said strength is less than a predetermined fraction of the maximum strength associated with any identified musical note contained within the data records;
-   ▪ determining (124) a first note from the identified musical notes as a function of their respective strengths;
-   ▪ selecting (128) at least a second and a third note from the identified musical notes as a function of the first note; and
-   ▪ determining (130) the key based on a comparison of the respective strengths of the at least second and third notes.

2.   A method as claimed in Claim 1, wherein each portion is the same size.

3.   A method as c laimed in Claim 1, wherein e ach p ortion e ncompasses the same length of time.

4.   A method as c laimed in Claim 1, wherein the size o f the p ortion i s a function of the tempo of the audio signal.

5.   A method as claimed in any of Claims 1 to 4, wherein the portions are contiguous.

6.   A method as claimed in any of Claims 1 to 5, wherein the predetermined fraction is determined in dependence on the content of the audio signal.

7.   A method as claimed in any of Claims 1 to 6, wherein the predetermined fraction lies in the range of one tenth to one half.

8.   A method as claimed in Claim 7, wherein the predetermined fraction is one seventh.

9.   A method as claimed in any of Claims 1 to 8, wherein the step of analysing the portion to identify a musical note comprises the steps of:
    o   converting (204) the portion to a frequency domain representation;
    o   subdividing (206) the frequency domain representation into a plurality of octaves;
    o   for each octave containing a maximum amplitude:
        ▪   determining (208) a frequency value at the maximum amplitude; and
        ▪   selecting (210) a note name of a musical scale in dependence on the frequency value;
        and
    o   identifying (216) a musical note in dependence on the same note name being selected in more than one octave.

10.   A method as claimed in Claim 9, wherein the conversion of the portion to a frequency domain representation is performed by means of a Fourier Transform.

11.   A method as claimed in Claim 9 or 10, wherein the musical scale is the Equal Tempered Scale.

12.   A method as claimed in any of Claims 1 to 11, wherein the step of determining a strength associated with the or each musical note comprises the steps of :

- determining the amplitude of each frequency component of the musical note; and

- summing the amplitudes.

13.   A method as claimed in any of Claims 1 to 12, wherein the step of determining the first note comprises the steps of :

- for each identified musical note, summing the strengths associated with the musical note in the data records; and

- determining the first note to be the identified musical note with the maximum summed strength.

14.   A method as claimed in any of Claims 1 to 13, wherein the first note is the tonic of the key.

15.   An apparatus for determining the key of an audio signal, the apparatus. comprising :

- an input device (510) operable to receive a signal;

- a data processing apparatus (502) operable to :

  o for each of a plurality of signal portions, analyse the portion to identify a musical note, and where at least one musical note is identified:

    - determine a strength associated with the or each musical note; and

    - generate a data record containing the identity of the or each musical note, the strength associated with the or each musical note and the identity of the portion;

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o   for each of the data records, ignore the strength associated with an identified musical note where said strength is less than a predetermined fraction of the maximum strength associated with any identified musical note contained within the data records;

o   determine a first note from the identified musical notes as a function of their respective strengths;

o   select at least a second and a third note from the identified musical notes as a function of the first note; and

o   determine the key based on a comparison of the respective strengths of the at least second and third notes.

16.   An apparatus as claimed in Claim 15, wherein the predetermined fraction is determined in dependence on the content of the audio signal.

17.   An apparatus as claimed in Claim 16, wherein the predetermined fraction lies in the range of one tenth to one half.

18.   An apparatus as claimed in Claim 17, wherein the predetermined fraction is one seventh.

19.   An apparatus as claimed in any of Claims 15 to 18, wherein for each of a plurality of signal portions, to analyse the portion to identify a musical note the data processing apparatus is operable to:

▪   convert the portion to a frequency domain representation;

▪   subdivide the frequency domain representation into a plurality of octaves;

▪   for each octave containing a maximum amplitude :

▪   determine a frequency value at the maximum amplitude; and

▪   select a note name of a musical scale in dependence on the frequency value;

and

- identify a musical note in dependence on the same note name being selected in more than one octave.

20.   An apparatus as claimed in Claim 19, wherein the data processing apparatus is operable to convert the portion to a frequency domain representation by performing a Fourier Transform.

21.   An apparatus as claimed in Claim 19 or 20, wherein the musical scale is the Equal Tempered Scale.

22.   An apparatus as claimed in any of Claims 15 to 21, wherein to determine a strength associated with the or each musical note the data processing apparatus is operable to:
- determine the amplitude of each frequency component of the musical note; and
- sum the amplitudes.

23.   An apparatus as claimed in any of Claims 15 to 22, wherein to determine the first note the data processing apparatus is operable to:
- for each identified musical note, sum the strengths associated with the musical note in the data records; and
- determine the first note to be the identified musical note with the maximum summed strength.

24.   An apparatus as claimed in any of Claims 15 to 23, further comprising an output device (518) operable to send data corresponding to the key of the audio signal.

25.   A record carrier comprising software operable to carry out the method of any of the Claims 1 to 14.

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26.   A software utility configured for carrying out the method steps as claimed in any of the Claims 1 to 14.

27.   A jukebox including a data processor, said data processor being directed in its operations by a software utility as claimed in Claim 26.